

WHAT IS CLAIMED IS:

1. A transfer apparatus for a semiconductor process, comprising:

5 an articulated arm unit attached to a support base to be stretchable/retractable within a horizontal plane, the articulated arm unit having a distal end arm which reciprocates in a first direction when the articulated arm unit stretches and retracts;

10 a support member arranged on the distal end arm to support a target substrate, the support member being attached to the distal end arm to be reciprocatable in the first direction;

15 a main driving mechanism configured to stretch/retract the articulated arm unit; and a sub-driving mechanism configured to reciprocate the support member relative to the distal end arm.

20 2. The apparatus according to claim 1, wherein the support member reciprocates relative to the distal end arm, while the articulated arm unit stretches and retracts.

25 3. The apparatus according to claim 2, wherein the sub-driving mechanism is mechanically connected to the main driving mechanism, such that reciprocation of the support member is performed in accordance with stretching/retracting of the articulated arm unit.

4. The apparatus according to claim 3, wherein the sub-driving mechanism includes a pair of pulleys

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axially supported by the distal end arm, and a belt extending between the pair of pulleys, the belt being connected to the support member.

5. The apparatus according to claim 3, wherein the sub-driving mechanism includes a pair of sprockets axially supported by the distal end arm, and a chain extending between the pair of sprockets, the chain being connected to the support member.

10. The apparatus according to claim 3, wherein the sub-driving mechanism is connected to the main driving mechanism through a speed-increasing device.

15. The apparatus according to claim 1, further comprising a controller configured to drive the sub-driving mechanism independently of the main driving mechanism.

20. The apparatus according to claim 7, wherein the sub-driving mechanism includes a piston cylinder disposed on the distal end arm, and a piston rod reciprocated by the piston cylinder, the piston rod being connected to the support member.

25. The apparatus according to claim 7, wherein the sub-driving mechanism includes a ball screw disposed on the distal end arm, a motor disposed on the distal end arm to apply a rotational driving force to the ball screw, and a ball nut engaging with the ball screw and connected to the support member.

10. The apparatus according to claim 1, further

comprising a pair of temporary shelves configured
to support the target substrate, and disposed to
sandwich the support member when the articulated arm
unit and the support member retract, and a vertical
driving mechanism configured to vertically drive
the support member and the temporary shelves relative
to each other in order to transfer the target substrate
therebetween.

11. The apparatus according to claim 10, wherein
the articulated arm unit is rotatable within a
horizontal plane relative to the support base, and the
transfer apparatus further comprises a rotational
driving mechanism configured to rotate the articulated
arm unit.

12. A transfer apparatus for a semiconductor
process, comprising:

an articulated arm unit attached to a support base
to be stretchable/retractable within a horizontal
plane, the articulated arm unit having a distal end
arm which reciprocates in a first direction when
the articulated arm unit stretches and retracts,
the articulated arm unit being rotatable within
a horizontal plane relative to the support base;

a support member arranged on the distal end arm to
support a target substrate;

a pair of temporary shelves configured to support
the target substrate, and disposed to sandwich the

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support member when the articulated arm unit retracts,

a main driving mechanism configured to stretch/retract the articulated arm unit;

5 a rotational driving mechanism configured to rotate the articulated arm unit; and

~~5~~ a vertical driving mechanism configured to vertically drive the support member and the temporary shelves relative to each other in order to transfer the target substrate therebetween.

10 13. An accommodating apparatus for a semiconductor process, comprising:

an airtight chamber;

a worktable with a mount surface to support a target substrate disposed in the chamber, the target substrate being loaded and unloaded, by a transfer apparatus, onto and from the worktable;

15 a set of first lifters and a set of second lifters configured to assist loading/unloading of the target substrate onto/from the mount surface, the set of first lifters and the set of second lifters providing support levels at different heights for the target substrate; 20 and

25 a lifter driving mechanism for vertically driving the first and second lifters relative to the worktable,

wherein the sets of first and second lifters are disposed to surround the worktable,

wherein the first and second lifters respectively

have fingers configured to support the target substrate, the fingers capable of being rotated between a projecting position where the fingers project toward the worktable, and a retreated position where the
5 fingers retreat from the worktable, and

wherein the worktable has recesses to correspond to the first lifters, and the fingers of the first lifters project into the recesses, when located at the projecting position, to enter under the mount surface.

10 14. The apparatus according to claim 13, further comprising a controller configured to control operations of the first and second lifters through the lifter driving mechanism, and to perform the steps of causing the set of second lifters to support an
15 untreated target substrate, transferred by the transfer apparatus, at an upper level above the mount surface, causing the set of first lifters to support a treated target substrate at an intermediate level between the mount surface and the upper level, and
20 driving the sets of first and second lifters to transfer the untreated target substrate from the upper level onto the mount surface, after the transfer apparatus removes the treated target substrate from the intermediate level.

25 15. The apparatus according to claim 13, wherein the apparatus is constituted as a semiconductor processing apparatus, and further comprises:

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a table driving mechanism for moving the worktable between lower and upper positions, the target substrates being loaded and unloaded, by a transfer apparatus, onto and from the worktable when the worktable is at the lower position, and the target substrate being processed when the worktable is at the upper position;

5 a supply system with a supply port disposed immediately above the worktable, which is at the upper position, to supply a process gas into the chamber; and

10 an exhaust system with an exhaust port disposed immediately under the worktable, which is at the lower position, to evacuate an interior of the chamber, and wherein the sets of first and second lifters are disposed to surround the worktable, which is at the lower position.

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16. A semiconductor processing system comprising:

an airtight process chamber;

a worktable with a mount surface to support a target substrate disposed in the process chamber;

20 a supply system configured to supply a process gas into the process chamber;

an exhaust system configured to evacuate an interior of the process chamber by vacuum;

25 an airtight transfer chamber connected to the process chamber through a gate; and

a transfer apparatus disposed in the transfer

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chamber to load/unload the target substrate into/from the process chamber, the transfer apparatus comprising an articulated arm unit attached to a support base

5 plane, the articulated arm unit having a distal end arm
which reciprocates in a first direction when the
articulated arm unit stretches and retracts;

a support member arranged on the distal end arm to support the target substrate, the support member being attached to the distal end arm to be reciprocatable in the first direction;

a main driving mechanism configured to stretch/retract the articulated arm unit; and

15 a sub-driving mechanism configured to reciprocate
the support member relative to the distal end arm.

17. The system according to claim 16, wherein the transfer apparatus further comprises a pair of temporary shelves configured to support the target substrate, and disposed to sandwich the support member when the articulated arm unit and the support member retract, and a vertical driving mechanism configured to vertically drive the support member and the temporary shelves relative to each other in order to transfer the target substrate therebetween.

25 18. The system according to claim 16, further comprising:

a set of first lifters and a set of second lifters

disposed to surround the worktable and configured to assist loading/unloading of the target substrate on/from the mount surface, the set of first lifters and the set of second lifters providing support levels at different heights for the target substrate; and

5 a lifter driving mechanism for vertically driving the first and second lifters relative to the worktable.

10 19. The system according to claim 16, wherein the support member reciprocates relative to the distal end arm, while the articulated arm unit stretches and retracts.

15 20. The system according to claim 16, further comprising a controller configured to drive the sub-driving mechanism independently of the main driving mechanism.

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